

In re Patent Application of
RAYNOR
Serial No. 10/645,320
Filed: AUGUST 21, 2003

REMARKS

Applicant thanks the Examiner for the careful and thorough examination of the present application, and the indication of allowable subject matter. By this amendment, Claims 14, 29 and 43 have been amended to further clarify the present invention. Claims 14-51 remain pending in the application. Favorable reconsideration is respectfully requested.

I. The Invention

As shown in FIGS. 3 and 4, for example, the disclosed invention is directed to a solid state image sensor and method including an active pixel image sensor being formed on a P-type epitaxial layer on a P-type substrate. An active pixel array is in the P-type epitaxial layer. Each pixel includes an N-well functioning as a collection node, and a P-well adjacent the N-well. The pixels include only NMOS transistors functioning as active elements. The in-pixel transistors cooperate with off-pixel PMOS transistors to form A-D converters.

II. The Claims are Patentable

Claims 14-19, 21, 22, 25, 29-33, 35, 36, 39, 43-45 and 47-49 were rejected in view the disclosed prior art discussed in the background section and illustrated in FIGs. 1 and 2 of the present application, and for the reasons set forth on pages 2-6 of the Office Action. The subject matter of Claims 20, 23, 24, 26-28, 34, 37, 38, 40-42, 46, 50 and 51 was

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indicated as being allowable. Applicant contends that Claims 14-19, 21, 22, 25, 29-33, 35, 36, 39, 43-45 and 47-49 clearly define over the cited art, and in view of the following remarks, favorable reconsideration of the rejections under 35 U.S.C. §102 and §103 is requested.

Each of the independent Claims 14, 29 and 43 recites that each pixel comprises a first well of a second conductivity type functioning as a collection node, and at least one second well of the first conductivity type adjacent the first well. Importantly, each pixel comprises a plurality of MOS transistors of only the second conductivity type functioning as active elements of the pixel. It is this combinations of features which is not fairly taught or suggested in the cited art and which patentably defines over the cited art.

The Examiner has relied on the disclosed prior art discussed in the background section and illustrated in FIGs. 1 and 2 of the present application as teaching the use of a second well of the first conductivity type having only NMOS transistors as active elements. However, the independent Claims 14, 29 and 43 have been amended to further clarify that it is the pixel that uses only MOS transistors of the second conductivity type.

Now that this clarification has been made, it is submitted that the invention as defined in independent Claims 14, 29 and 43 is clearly novel over the applicant's admitted prior art, as the pixel illustrated in Figure 1 of such prior art comprises a P well with MOS transistors of the N

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conductivity type and an N well with MOS transistors of the P conductivity type. Paragraph 19 of the present application describes that, for correct operation of such a pixel, the P well 16 is biased to Vss (ground/0 volts), the N well is biased to Vdd, typically 3.3 volts or 1.8 volts, while the collection node 14 is biased to a voltage between Vss and Vdd. Figure 2 then shows NMOS transistors M1-M4 and a comparator formed from PMOS transistors M5-M7 and NMOS transistor M8.

As the Examiner is aware, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as is contained in the claim.

As described in paragraph 37, the invention provides image sensors in which the pixels have greater sensitivity than those of the prior art. This is because, as described in paragraph 24, the sensor of the present invention does not need or have an N well other than the N well forming the collection node 14. Electrons generated in the epitaxial layer 10 are attracted to the most positive point in the pixel, which is now the collection node 14, thus increasing the sensitivity.

There is simply no teaching or suggestion in the cited art to provide the combination of features as claimed. Accordingly, for at least the reasons given above, Applicant maintains that the cited art does not disclose or fairly suggest the invention as set forth in Claims 14, 29 and 43. Furthermore, no proper modification of the teachings of this

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reference could result in the invention as claimed. Thus, the prior art rejections should be withdrawn.

It is submitted that the independent claims are patentable over the prior art. In view of the patentability of the independent claims, it is submitted that their dependent claims, which recite yet further distinguishing features are also patentable over the cited reference for at least the reasons set forth above. Accordingly, these dependent claims require no further discussion herein.

III. Conclusion

In view of the foregoing remarks, it is respectfully submitted that the present application is in condition for allowance. An early notice thereof is earnestly solicited. If, after reviewing this Response, there are any remaining informalities which need to be resolved before the application can be passed to issue, the Examiner is invited and respectfully requested to contact the undersigned by telephone in order to resolve such informalities.

Respectfully submitted,



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